an entire American factory to a French firm which is 79 percent owned by the U.S. firm. Obviously, the complex interchange of goods among countries requires much more understanding before DISC is enacted and the U.S. taxpayer undertakes an annual $500 million to $1 billion tax subsidy of our largest corporations.

IN DEFENSE OF PRESENT RADIATION LIMITS

HON. CHET HOLIFIELD

OF CALIFORNIA

IN THE HOUSE OF REPRESENTATIVES

Wednesday, October 7, 1970

Mr. HOLIFIELD. Mr. Speaker, in the Medical World News of September 11, Dr. Robert D. Moseley, Jr., a leading radiologist with many distinguished degrees answered a series of questions on the subject of radiation standards. Dr. Moseley is now serving as chairman of the department of radiology at the University of Chicago's Pritzker School of Medicine. He is also chairman of the American College of Radiology's Commission on Public Health; chairman of the Atomic Energy Commission's Advisory Committee on Biology and Medicine and he is a member of the National Council on Radiation Protection and Measurements.

His long background of experience and knowledge in this complex area makes his remarks, which follow, very pertinent:

IN DEFENSE OF PRESENT RADIATION LIMITS

WHILE THE STANDARDS HAVE BEEN UNDER SHARP ATTACK LATELY, A LEADING RADIOLOGIST FINDS THEM NOT ONLY SAFE BUT CONSERVATIVE

The standards generally accepted for the safe use of ionizing radiation in medicine and industry have been under attack recently. Critics charge that the present permissible levels of radiation exposure are too liberal and constitute a health hazard both to workers and the general public. They further maintain that advisory bodies such as the Federal Radiation Council (FRC) have been complacent, failing to act upon evidence suggesting that the permissible levels are too high, and failing to properly inform the public of the dangers of even low levels of radiation.

These critics have attracted plenty of publicity in testifying before the Joint Congressional Committee on Atomic Energy. Less in the public eye are the many responsible radiologists and scientists who insist that current exposure standards are reasonable safeguards and that the criticism of them and of the advisory bodies is distorted and misleading.

In the interest of balance and without attempting to resolve the issue, MWN has asked one of the defenders of current radiation guidelines to present his views. He is Dr. Robert D. Moseley, Jr., chairman of the department of radiology at the University of Chicago's Pritzker School of Medicine; chairman of the American College of Radiology's Commission on Public Health; chairman of the Atomic Energy Commission's Advisory Committee on Biology and Medicine; and a member of the National Council on Radiation Protection and Measurements.

Q. Dr. Moseley, who has the responsibility for determining exposure guidelines and safety standards?

A. The International Commission on Radiation Protection was established in 1928. In 1929, a similar committee was formed in the U.S., and this group has been in continuous operation since that time, becoming a federally chartered nongovernmental body in the 1950s under the title of the National Council on Radiation Protection and Measurements (NCRPM). More than 70 scientists and physicians participate in its efforts on a voluntary basis. In 1959, the FRC was set up to establish guidelines for government agencies on radiation safety.

Q. Do the recommendations of these advisory groups have the force of law?

A. Those of the FRC do for federal agencies. The Atomic Energy Commission, operating under FRC guidelines, has the power to regulate the use of atomic energy. In addition, most states have laws regarding radiation standards incorporating or following the guidelines of the NCRPM.

Q. What are these guidelines?

A. The maximum permissible exposure recommended by the national committee in the 1930s was 0.1 r per day for radiation workers (about 30 r a year). This was less than 1/1,000 the dose needed to produce skin damage, which was one of the standards then used to measure biologic hazard. In the late 1940s, the committee made the first modifications in this standard and subsequently its recommendations were accepted internationally. The recommended maximum permissible dose for radiation workers was reduced under this modification to 0.3 r per week. It is significant to note that this lowering of the level was not based on any new biomedical information; there was no new evidence whatever of injury at the previously accepted levels. It was lowered in recognition of the increase in the number of radiation sources due to the development of atomic energy, and of the presence of many different kinds and quantities of radiation.

The most recent changes of any significance were made in 1957, when the NCRPM revised the maximum permissible dose downward again to an average of 5 r per year for radiation workers (or 0.1 rem per week), reflecting increased concern for the effects of radiation on genetic material. At the same time, the NCRPM recommended a maximum level of 0.5 r per year for individuals in the general population—a maximum dose level one tenth that considered safe for radiation workers. The FRC guidelines, although expressed in slightly different terms, are, in fact, the standards recommended by the NCRPM.

Q. What is your opinion of the current guidelines? Do they reflect an adequate margin of safety?

A. They are, if anything, conservative, although there is no reason to recommend that they be increased. It is possible for society to have the benefits of radiation within these limits, so they should be maintained as an added margin of safety. The best current experimental evidence indicates that the NCRPM in 1957 over-estimated the genetic hazard of ionizing radiation at low-dose levels and rates—not underestimated as many critics are now charging.

Q. Are these recommended maximum levels ever exceeded to any significant degree either by radiation workers or by the general public?

A. No. Barring accidents, workers and the general population are exposed to only a fraction of the allowable amount.

Q. Are there any new data, experimental or clinical, to indicate that acceptable levels are too high?

A. The only new and reliable data of which I'm aware would tend to support the opposite conclusion. Recent work suggests that there is a recovery rate for genetic material, a time-dose relationship that is quite significant not only for somatic tissue but also for genetic material. It has never been assumed in developing standards for genetic material that the relationship between dose and effect was anything other than linear or that there was any recovery, even though experimental evidence at the low-dose range is lacking.

Q. To what then do you attribute the recent upsurge in concern over the radiation hazard, real and potential?

A. For reasons I don't understand, the dangers of ionizing radiation are being significantly exaggerated. It's something of a fad fanned by reports in the public press and connected with increased public concern over environmental pollution. If radiation is an environmental pollutant, it is the one we know the most about both in terms of its nature and its potential danger. It isn't something new or something just discovered. It is something whose impact upon the human organism has yet to be assessed. Roentgen discovered x-rays in 1895, and by 1896 some of the potential harmful effects of x-rays were already known. And they have been the subject of extensive regulation continuously since then.

Q. One of the most widely publicized charges made by critics of current radiation standards is that these limits permit the induction of thousands of human cancers every year. How do you answer that charge?

A. Most of these charges are mathematical exercises based upon hypothetical extrapolations from the worst possible case assumptions. They have no basis in experimental, epidemiological, or clinical data.

Q. What is meant by safe level of radiation?

A. This gets into the threshold problem, which is probably the crux of the dispute between those who feel there is no such thing as a tolerable level of radiation exposure and those, like myself, who maintain that the benefits of radiation are such that we can tolerate a certain minimum level. It is agreed that at high level the dose-effect relationship is linear and that at zero dose there is of course zero response. But what about the dose-effect relationship at low energy levels? Is it linear or is there a curve—in effect, a threshold? To get definitive answers we would need an inordinate number of experimental animals. Someone has estimated that it would require more mice for the test and control groups than are produced for laboratory use in an entire year. However, it may be possible to design experiments relating to low-dose rates that would be feasible, statistically sound, and could be expected to increase our knowledge in this area.

Q. If there is no hard evidence about low-dose effects, wouldn't it be prudent to assume that there is no threshold, at least for genetic material, and base our radiation practices on that assumption?

A. It would be very prudent, and that, in fact, is the course that has been taken by the bodies making recommendations in this area. A linear dose-effect response for genetic material is the conservative hypothesis that is assumed. Some critics argue that radiation safety standards assume a threshold. This is not true. At no point in any of the NCRPM statements is there a threshold assumed. In fact, there is considerable discussion in NCRPM documents defending the assumption of a no-threshold hypothesis.

I do not believe that anyone working in radiation would deny that exposure should be held to the lowest possible level. You should remember that when we talk about maximum levels, the operative word is maximum. It doesn't mean that all members of the society should, with impunity, be exposed to these levels, or that any significant number of them will be. It doesn't represent a rate in any way corresponding with the actual degree of radiation exposure. The exposure to anyone working with a nuclear power reactor, for example, is approximately 1% of the permissible maximum dose.

Q. If there is no threshold assumed for genetic material, what about somatic cells?

A. The repair process in these cells is better understood and there's much more rea-

son to believe that a practical if not absolute threshold exists. There's good evidence that somatic cells do repair themselves. Nonetheless, the threshold assumption has not been used as a hypothesis by the regulatory agencies.

Q. What about the factor of individual variability? Is it sufficient to negate any assumption of safe exposure levels in the general population?

A. Interspecies variability is considerable. But intraspecies variability is not great enough to be a factor in setting up radiation protection standards for a given species such as man.

Q. Is diagnostic radiology overused?

A. Yes, but I don't know to what degree nor do I know what radiologists can do to curb overuse other than to participate in the education of all physicians concerning radiation problems. Diagnostic radiology is an extremely powerful tool. But there is no way for the radiologist to hold down the number of diagnostic procedures since most of his patients are referrals from other physicians, men who have the primary responsibility for the care of the patient and a more intimate knowledge of his history. There is also some minor abuse engendered by legal considerations. The medicolegal precedents are such that a physician places himself in jeopardy in some cases—accidental injury, for instance, if an x-ray examination is not given.

Q. Should diagnostic radiologic examination be included in routine screening procedures or in multiphasic screens?

A. It depends upon the patient population involved. In an affluent, suburban area where the incidence of tuberculosis is low, routine chest mocrofilms may not be justified. But in a disadvantaged area, the incidence of tuberculosis might justify them. You can't give a blanket answer to that question; it depends on questions of population age, incidence of disease, epidemiology, etc. I am in favor, though, of routine chest x-ray examinations on admission to a hospital. These turn up a significant incidence of disease, and the radiation dose received in a routine chest examination is so low that it's difficult to fault the procedure in that situation. In examinations such as those of the gastrointestinal tract, however, the dose received is higher and the incidence of disease turned up is lower. In these cases. I'd have serious doubts about using radiologic procedures in routine screens.

Q. The number of x-ray examinations given each year is increasing faster than the population, and some critics see a potential threat in this. What do you think?

A. The annual increase in the number of procedures is about 7% to 12%, but I don't believe this constitutes any serious threat to our population. For one thing, many of the procedures are done on our growing number of geriatric patients, where the genetic problem is insignificant. The delivery of optimum medical care to our population will undoubtedly mean a continuing rise in radiologic examinations.

Q. Do the new diagnostic procedures contribute to an increase in the hazard of radiation exposure?

A. No. There are many new and sophisticated techniques, but they account for only 3% to 5% of the total number of procedures performed.

Q. What about radioisotope procedures?

A. These are increasing at a rate of about 15% a year, but here again, they don't constitute a health hazard. In general, the dose of radiation per procedure is less than that received in the conventional diagnostic x-ray.

Q. To what degree does background radiation in our society constitute a health hazard?

A. We live in a radiation world. The average dose per person from such sources as cosmic rays, radioactive phosphorus in the food we eat, radium and uranium in the soil, and other background sources is about 100 mr per year. In this country, the range is from 100 to 250 mr per year depending upon the area and altitude. The higher up you are the more exposure you get. It's been calculated that the average genetically significant dose received by the average American from all radiologic examinations is about 55 mr. Thus, a person living at sea level with average diagnostic x-ray procedures receives less in total genetically significant radiation than a man living in the Western mountains who receives no x-ray examinations. I think this may help place the question of x-rays in perspective.

Q. What are the long-term effects of acute exposure to large radiation doses?

A. In the survivors of Hiroshima and Nagasaki, there has been a rise in the incidence of leukemia and a few statistically significant increases in other somatic cancers.

Q. Has the publicity given radiation dangers had any adverse effects on diagnostic radiology; have patients refused x-ray exams, for example?

A. Not to any noticeable degree yet. Maybe patients are more sensible than scientists. If overestimation of the hazards began to have such an effect, though, the result would be detrimental to the public health. This would be far worse than any presumed radiation danger.

Q. If the campaign to lower permissible radiation exposure standards continues, could it hurt the practice of radiology?

A. Yes, if it results in restrictive legislation. It's easy to charge, on the basis of unproven hypotheses, that diagnostic procedures are increasing the incidence of cancer. We all know that radiation in excess is harmful, so might not such a charge concerning low-dose radiation also be true? Unfortunately, a rebuttal requires a lengthy and technical reply that doesn't carry the punch of the initial charge. But so far, legislators have shown a balanced, informed outlook.

Q. Do you feel the public is sufficiently informed about the potential hazards of radiation?

A. A case can be made that they aren't. But it would require an extensive educational program to fully inform the public. I do know, however, that the public is sufficiently protected from radiation hazards. Occasionally there are mistakes, such as the manufacture of a few defective color television sets. But even in this much-publicized instance, the potential amount of radiation exposure didn't constitute a significant health hazard. The largest significant sources of radiation are diagnostic procedures, which are in the hands of trained people.

Q. Are physicians and hospital personnel sufficiently aware of radiation hazards and do they take precautions against excessive exposure of both themselves and patients?

A. The Public Health Service surveyed radiation practices in 1964, and another such study is underway now. The 1964 survey showed no significant degree of radiation hazard from improper x-ray techniques, but indicated that there was still room for improvement. The main problem is to properly collimate the beam with regard to the film size and thus cut the genetically significant dose, and I'm confident that the latest study will show significant progress toward this goal.

SPEECH DELIVERED BY MAJ. GEN. LEO J. DULACKI

HON. JAMES A. BYRNE

OF PENNSYLVANIA

IN THE HOUSE OF REPRESENTATIVES

Wednesday, October 7, 1970

Mr. BYRNE of Pennsylvania. Mr. Speaker, I am proud and honored to include in the RECORD the very impressive speech delivered by Maj. Gen. Leo J. Dulacki, USMC, commanding general of the 4th Marine Division, on Sunday, October 4, at the Annual Pulaski Day Observance in Philadelphia. It was my pleasure to attend this important ceremony which was held at Independence Hall.

The speech follows:

REMARKS BY MAJ. GEN. LEO J. DULACKI, USMC

Mayor Tate, distinguished guests, ladies and gentlemen:

Szanowne Panie and Panownie.

Ja nie bede mowic po polsku dzisiaj dlatego ze nie mowie bardzo dobrze po polsku, ale chcialem zaznaczic ze jestem polakiem I mowie troche po polsku. I teraz S waszem pozwoleniem bede mowic po angielsku.

Those of you who do not speak Polish will have to depend on your Polish friends to interpret those few words I have spoken in Polish.

It is a distinct pleasure and great honor for me to participate in these proceedings today, in Philadelphia, for two reasons.

It was here, in Philadelphia, almost 200 years ago, that the U.S. Marine Corps first began its long tradition of service to country. Every Marine knows of Tun Tavern, which is not far from this very spot. Every Marine knows that it was here in Philadelphia that the first company of American Marines was raised. So all Marines have a close and warm relationship with Philadelphia, the cradle of liberty.

I also believe it is appropriate for an officer of the United States Marine Corps, even if he were not Polish, to be called upon to pay tribute and render honor to the great memory of General Casimir Pulaski. The Marine Corps was established during the American Revolution to first fight for the cause to which Pulaski was also dedicating himself. You might say that we, the Marine Corps and General Pulaski, are truly brothers-in-arms.

Throughout the years, since its founding, the Marine Corps has nobly and honorably endeavored to defend those principles which first brought Pulaski to the American shores for which he eventually gave his life. The fundamental of those principles is that if the freedom of any man, anywhere in the world is threatened, then the freedom of all men is threatened, and it is the duty of all free men to raise their voices, yes their swords, in the defense of their fellow man.

The heritage of Pulaski is that the cause of freedom is not limited by any boundaries of time, nationality, or geography. The long journey of Pulaski to our shores, many years ago, demonstrates the universality of the cause of freedom.

Today, there are many questions, questions raised by sincere and patriotic Americans, in regard to the commitment of the United States to the struggle in Vietnam. Americans search for an answer to the question: 'Why are we in Vietnam and is it worth the great price we are paying?" To find answers to those questions, we should look back to the early days of our Nation's history, as in fact we are doing today, to the days of Pulaski, if you will. History is not impersonal; it is a record of man—his trials and tribulations, his goals, his dreams, his hopes, his achievements. And history shows that the basic desires and wants of man have not changed throughout the centuries.

The lesson of history is that it has never been easy to protect freedom. In almost every war we have fought, there have been well-meaning voices crying out that the war was unwise or unnecessary. Such cries were also heard during the revolution. But despite those cries, even on distant shores, men like Pulaski heard the voice of freedom crying in anguish and they came forth bravely and